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(74) Agent: **ROBINSON, Simon, Marc**; SPIRES IP LTD, 20  
Bridge Street, Oxford OX2 0BA (GB).

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(71) Applicant (*for all designated States except US*): **TEMP-PLATE TECHNOLOGIES LIMITED** [GB/GB]; 13 St Brelades Road, Crawley, West Sussex RH11 9RQ (GB).

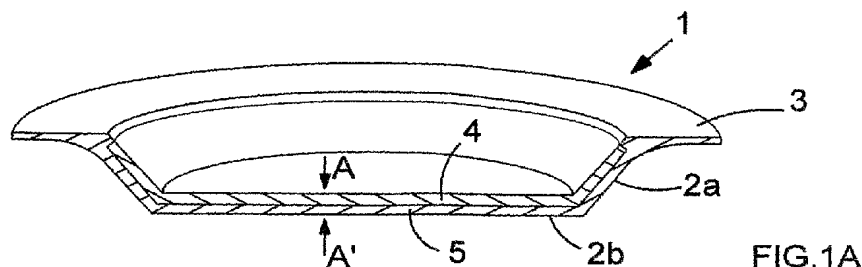
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(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **SMITH, Amanda, Jane** [GB/GB]; 6 Tudorville Road, Bebington, Wirral CH63 2HV (GB). **GINN, Sarah, Carol** [GB/GB]; 13 St Brelades Road, Broadfield, Crawley, West Sussex RH11 9RQ (GB). **VAIDHYANATHAN, Balasubramaniam** [GB/GB]; 58 Roundhill Way, Loughborough, Leicestershire LE11 4WB (GB).

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(54) Title: TEMPERATURE FRIENDLY KITCHEN PRODUCTS



(57) Abstract: A kitchen product container (1) is provided for holding food/drink, said food/drink having a user-unfriendly temperature to touch. The container (1) comprises one or more wall(s) (2a,b) having at least two sections (4,5): a first, inner section (4), having an inner surface for supporting food/drink; and a second, outer section (5); wherein the cross-section of the first section (4) comprises a plurality of layers (6, 7, 8, 9) of composite materials, each of said layers (6, 7, 8, 9) comprising a mixture of a percentage of at least one thermally conducting material, and a percentage of at least one thermally insulating material; and wherein the second section (5) is comprised solely of thermally insulating material(s).

## Temperature Friendly Kitchen Products

### TECHNICAL FIELD

The present invention relates to kitchen products, for example plates, saucers, cups,  
5 mugs, baking trays and the like that are easy and safe to handle even when containing  
hot or cold foods or drinks.

By 'kitchen products', it is intended to include 'cookware', 'tableware', and  
'dinnerware', and so forth.

10

In particular, the prior invention relates to such utensils that are temperature-controlled  
so that they are hand-friendly when their contents are hot.

These types of utensils are especially useful for vulnerable users including children and  
15 persons having, for example, disabilities such as impaired sight. Hot consumables can  
be potentially very dangerous for these users.

### BACKGROUND ART

It is known to make such utensils of plastics material, for example, styrene. An  
20 example of this type of container, a microwaveable saucer, is described in JP-A-07-  
204088 as published in 1995. Whilst plastics utensils are safer than china ones, because  
they have relatively thermoinsulating characteristics, they are not aesthetically as  
pleasing to handle and they tend not to be thermally resilient enough for oven-ready  
baking purposes.

25

It is also known to use even more rigid materials, such as ceramics, metals or metals  
coated in ceramics, which may be ovenproof. Typically, however, oven gloves have to  
be used for removing them from traditional or microwave ovens. Thus, importantly,  
most such utensils do not enable hot contents to remain hot for significant durations,  
30 whilst concurrently permitting their handlable surfaces to be touched or held without  
protection.

It is therefore one aim of the present invention to provide kitchenware that can contain heated foods/drinks whilst at the same time being easy to hold and carry, and that is capable of maintaining the temperature of the heated contents for prolonged periods.

5 DISCLOSURE OF INVENTION

Thus, according to one aspect, the present invention provides a container for holding food/drink according to claim one.

10 The container's wall(s) have an outer section that can be easily handled despite the temperature of the contents.

The inner section of the wall(s), however, is able to contain and maintain the thermal nature of the contents.

15 As such, the inner section is constructed in layers of composite material, each layer having a different and specific composition compared to that the other layer(s).

20 The layering arrangement of the inner section provides a functionally graded (or gradient) material (FGM). As such, the principles for manufacturing different types of FGMs have recently (particularly since about 2002) become better understood and has been applied to specified materials in the fields of, for example, turbine engines, ballistics, space and air craft, and medicine.

25 In essence, FGMs allow the different beneficial properties of their individual constituent materials to be expressed together in the resultant products that are formed.

30 In one embodiment, the present invention provides a user-friendly plate having walls with sections containing varying amounts of ceramic material in combination with increasing levels of other materials, such as stainless steel. In this way the advantages of heat resistance, physical strength and varying thermoinsulating /conducting properties attributable to each constituent material can be combined in a synergistic manner.

The layering principle for such composite layers also reduces the likelihood of fracturing of the wall(s) and separation of individual layers from one another. This would otherwise tend to occur due to the relative extremes of heat conditions experienced by the product during and after cooking.

The differentiated and graded nature of the thermal properties of the materials helps to distribute heat in a more uniform gradient across the width of the walls.

Depending upon the precise temperatures used, such a plate can contain heated food for extended lengths of time, for example up to 45 minutes or so, before the plate becomes too hot to handle. At the same time the top layers of the plate get hot quickly, to help cook the contents, and cool down slowly, so as to keep the contents hotter for longer, without risk to the user.

Further advantageous features of the product of the invention are mentioned in the accompanying subsidiary claims.

The present invention will now be described in a further detail by way of the following examples as illustrated in the accompanying drawings, in which:

#### BRIEF DESCRIPTION OF DRAWINGS

Figure 1A shows a cut-away schematic view of a plate according to one embodiment of the present invention;

Figure 1B illustrates in greater detail the wall structure of the plate shown in Figure 1A, specifically in a cross-sectional view along direction A-A' as depicted;

Figure 2A shows a side view of a plate according to one embodiment of the present invention; and

Figure 2B illustrates a plan view of the plate shown in Figure 2A.

BEST MODE FOR CARRYING OUT THE INVENTION

The plate shown in Figure 1A has side- 2a and base- 2b walls for containing food that may be either solid or liquid (for example, soup), as well as a rim 3 that can be3  
5 grasped. The walls 2 comprise an inner section 4 and outer section 5, which are shown in greater detail in Figure 1B.

Section 4 contains a plurality of layers, for example, the four layers shown in Figure 1B.

10 Typically, section 5 comprises solely one or more thermoinsulating material(s). Layers 6, 7, 8 and 9 of section 4, however, usually comprise a composite of a plurality of materials having differing thermal characteristics, for example having some material of a thermoconductive nature and some material of a thermoinsulating nature.

15 In this way a functionally gradient material is used to form at least part of the walls 2 with a gradient 10 of increasing relative thermoconductivity towards the interior (food/drink containing part) of the plate.

In a specific embodiment, the composition of the layers is as follows:

20

- |            |                              |             |
|------------|------------------------------|-------------|
| - layer 6: | 95% metal/ceramic composite; | 5% ceramic  |
| - layer 7: | 90% metal/ceramic composite; | 10% ceramic |
| - layer 8: | 85% metal/ceramic composite; | 15% ceramic |
| - layer 9: | 80% metal/ceramic composite; | 20% ceramic |

25

Stainless steel may be used as the metal and such a plate is suited for oven cooking. Other suitable metals can be used.

The ceramic material may comprise alumina (aluminium oxide).

30

Instead of a metal, zirconia (zirconium oxide) may be used to form the composite providing the majority percentage of the layers. Such a plate is suited to microwave cooking since the zirconia helps the layers to heat in the presence of microwaves.

- 5 On the base layer of the plate an optional small area of piezo-electric ceramic material may be present. When present this can act as a thermal sensor alarm that, on reaching a certain temperature, creates an electric signal in the ceramic in the form of a loud noise.

- 10 On the rim of the plate an optional area of a different sensor material, such as a thermo-chromic, piezo-chromic or chromo-electric sensor material may be included. When the rim reaches the desired alarm level temperature, this type of sensor changes colour to provide a warning to help people with, for example, good sight and particularly those with impaired hearing.

- 15 The sensor can therefore act as a precautionary device to help alleviate any potential accidents should the plate be left in the oven for too prolonged a period of time and thus become too hot to touch. The sensors are typically triggered when the base layer temperature reaches an alarm level of approximately between 40 to 45°C.

- 20 The letter 'O' can optionally be embossed on the underside of the bottom of the plate, so making it easier for users to distinguish it from other plates and to illustrate that it can be used for the 'O'ven.

- 25 In a preferred embodiment, shape of the plate is adapted to provide a steep-sided food holding part and a wide rim. This allows the plate to be easier to hold and to eat from, especially for those with dexterity and visual impairments.

- 30 Preferably, high-contrast colours are utilised in the plate design to enable the visually impaired to see the plate on the table, the food on the plate, and the cold rim from the central hot part.

A raised internal lip 14 of the rim is added to the design to provide a tactile boundary defining where the cold rim ends and the hot ceramic starts. This is especially useful for the visually impaired.

- 5 As well as an upstanding lip 14 to the rim, the latter may also be provided with raised ridges 11 as a further guide for visually impaired users to help them to locate the lip 14.

The utensil need not be a plate, but the principles of construction can be extended to most *products of tableware*, dinnerware and kitchenware, thus examples of the utensil  
10 could include cups, mugs, saucers, bowls, cooking pots, baking trays and so forth.

In this way, the present invention provides a *temperature-friendly plate* or other such container that can be used safely for holding hot contents and/or for oven/microwave cooking of such contents, especially by vulnerable users.

## CLAIMS

1. A kitchen product container (1) for holding food/drink, said food/drink having a user-unfriendly temperature to touch, said container (1) comprising one or more wall(s) (2a,b) having at least two sections (4,5):

- a first, inner section (4), having an inner surface for supporting food/drink; and
- a second, outer section (5);

wherein the cross-section of the first section (4) comprises a plurality of layers (6, 7, 8, 9) of composite materials, each of said layers (6, 7, 8, 9) comprising a mixture of a percentage of at least one thermally conducting material, and a percentage of at least one thermally insulating material; and wherein the second section (5) is comprised solely of thermally insulating material(s).

2. A container as claimed in claim 1, wherein each successive layer of said first section (4) has a relatively greater percentage composition of the conducting material than that of the respective layer that adjoins it in a direction (10) perpendicularly towards the inner surface and thus towards any food/drink, so as to provide a gradient of layers of increasing thermoconductivity.

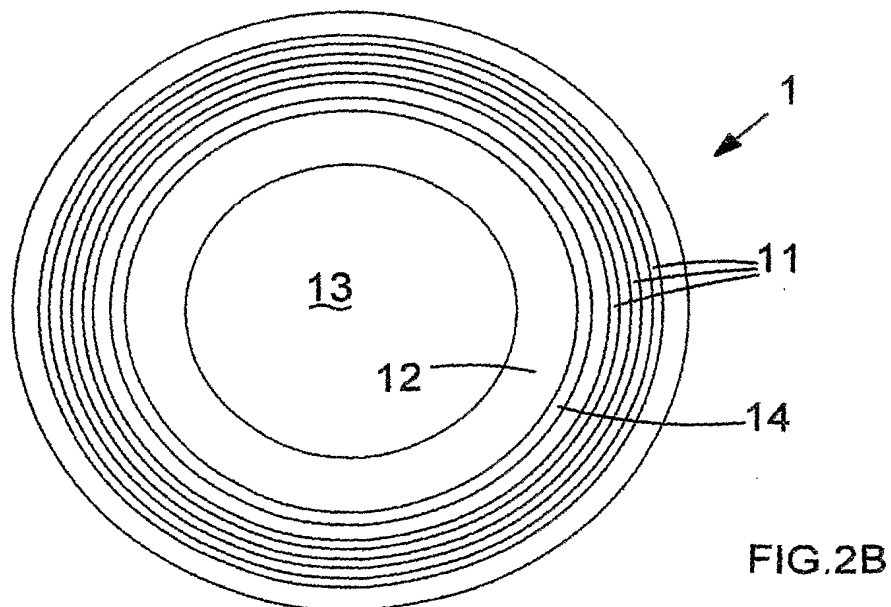
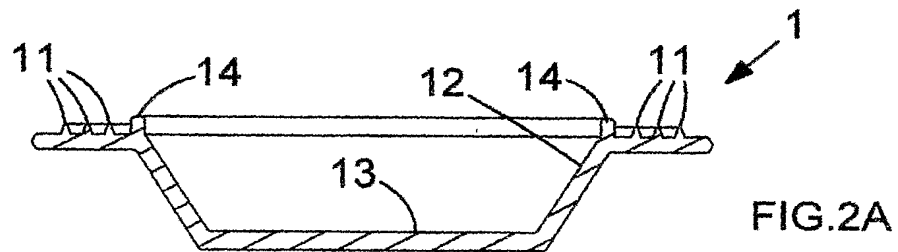
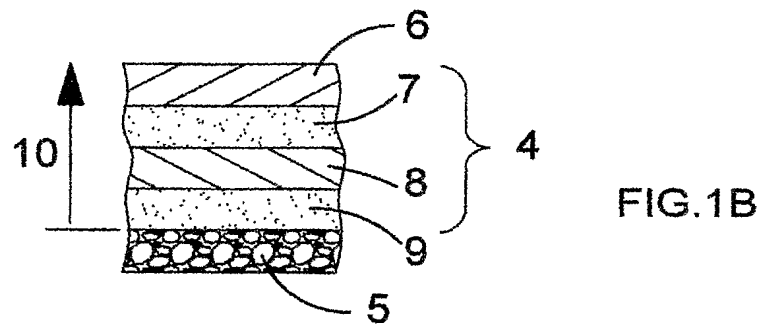
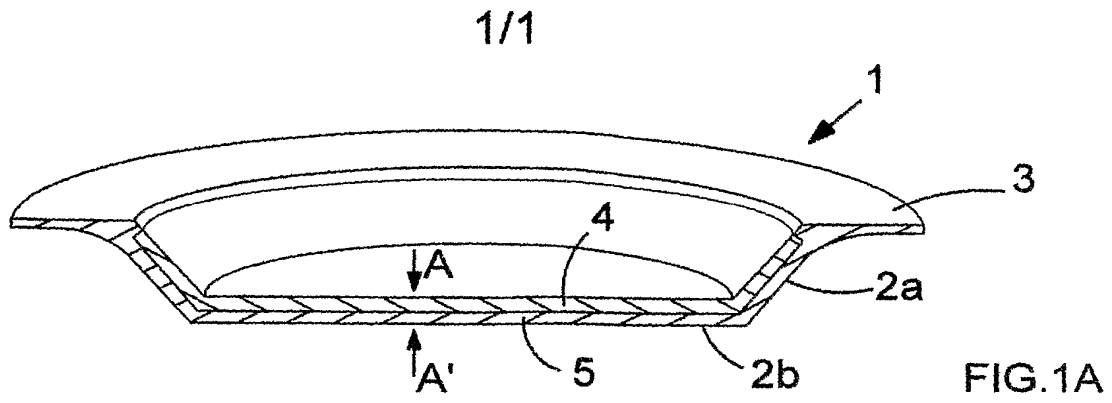
3. A container as claimed in either claim 1 or claim 2, wherein each layer of the first section (4) comprises a composite of ceramic material and either stainless steel or zirconia.

4. A container as claimed in any preceding claim, wherein the second section (5) comprises a ceramic material.

5. A container as claimed in any preceding claim, wherein the first (4) and/or second (5) sections comprise alumina.

6. A container as claimed in any preceding claim, wherein the first section (4) comprises a material heatable by oven heat.
7. A container as claimed in any preceding claim, wherein the first section (4)  
5 comprises a material heatable by microwaves.
8. A container as claimed in any preceding claim, wherein each layer (6, 7, 8, 9) has a relatively higher percentage composition of said thermally conducting material as compared to said thermally insulating material.  
10
9. A container as claimed in any preceding claim, being a mug, cup, saucer or bowl.
10. A container as claimed in any preceding claim, further comprising one or more  
15 unit(s) for grasping the item, said unit(s) being thermally insulated from any contained food/drink such that said unit(s) have a user-friendly temperature to touch.
11. A container as claimed in any one of claims 1 to 10, being a plate.  
20
12. A container as claimed in claim 10, being a plate with a surrounding rim (3) attached to said wall(s), said rim (3) providing the graspable unit.
13. A container as claimed in claim 12, comprising an elevated upstanding lip (14)  
25 adjoined to said rim (3) and surrounding the uppermost aspect of said inner surface, said lip (14) providing a physical indication to guide the user to the location of the contents within said inner surface.
14. A container as claimed in claim 13, wherein the upper surface of said rim (3)  
30 comprises one or more guiding ridges (11).

15. A container as claimed in claim 13, wherein the guiding ridges (11) are circles of increasing diameter circumferentially around the central longitudinal axis of the plate.
- 5 16. A container as claimed in claim 13, wherein the guiding ridges (11) are non-circular lines directed towards the central longitudinal axis of the plate.
17. A container as claimed in any of claims 12 to 16, wherein the rim (14) is of a colour different from that of the rest of the container.
- 10 18. A container as claimed in any of claims 12 to 16, wherein the wall(s) are of a colour different from that of the rest of the container.
- 15 19. A container as claimed in any of claims 12 to 18, wherein the second section (5) comprises a heat sensor capable of emitting a warning audible signal.
20. A container as claimed in claim 19, wherein the heat sensor comprises piezo-electric material.
- 20 21. A container as claimed in any of claims 12 to 20, wherein the rim (14) comprises a heat sensor capable of emitting a warning visual signal by way of a change of colour.
- 25 22. A container as claimed in claim 21, wherein the heat sensor comprises thermo-chromic, piezo-chromic or chromo-electric material.
23. A container (1) substantially as hereinbefore described with reference to, and/or as illustrated by, the accompanying drawings.



# INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2008/001022

## A. CLASSIFICATION OF SUBJECT MATTER

INV. A47G19/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47G H05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 977 302 A (MERIGAUD BERNARD ET AL) 11 December 1990 (1990-12-11) column 1, line 50 - column 2, line 3 -----	1,3-9
A	JP 09 052783 A (ISHIDA EISUKE) 25 February 1997 (1997-02-25) abstract: -----	1
A	JP 63 311910 A (NIPPON LIGHT METAL CO) 20 December 1988 (1988-12-20) figure 3 -----	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

\* Special categories of cited documents:

\*A\* document defining the general state of the art which is not considered to be of particular relevance

\*E\* earlier document but published on or after the international filing date

\*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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\*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\* & \* document member of the same patent family

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European Patent Office, P.B. 5818 Patentlaan 2

NL - 2280 HV Rijswijk

Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,

Fax: (+31-70) 340-3016

Authorized officer

Reichhardt, Otto

# INTERNATIONAL SEARCH REPORT

Information on patent family members

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